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| 09/926,402 | 10/26/2001 | Eric Pilat | 215245US6XPCT | 1644 |

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| EXAMINER |
|---|
| EDMONDSON, LYNNE RENEE |

| ART UNIT | PAPER NUMBER |
|---|---|
| 1725 | 7 |

DATE MAILED: 11/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/926,402 | PILAT, ERIC | |
| | Examiner | Art Unit | |
| | Lynne Edmondson | 1725 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *26 October 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-18,21-25,28* is/are rejected.

7)☒ Claim(s) *11,19,20,26 and 27* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5,6* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-3, 13-17 and 22-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Gruber (USPN 5673846).

Gruber teaches a method of making solder balls or pads on an electric component the method comprising the injection of molten solder into a guide open at one end wherein the guide is formed by two separable parts, a mold (16) and an injection matrix (12) comprising passages with a narrowing of the guide (upper portion of section 18) at the level of separation of the parts. The parts are separable in the direction of injection. The matrix is separated from the mold while the alloy is still liquid (figure 1 and col 2 line 60 – col 3 line 41). The mold may be separated from the solder while the solder is liquid (liquid transfer, col 3 lines 24-41 and col 6 lines 6-29). In another embodiment, the mold may be cooled to solidify solder in the mold (col 8 lines 4-28). The liquid solder takes the shape of a ball when cooled (figures 9A-9C). The

guide comprises a mold (16) and matrix (12) with two parallel faces and coaxially aligned passages which are perpendicular to the faces. The passages have a truncated cone shape with a sudden narrowing at the diameter at the level of separation. The holes in both parts have the same diameter (figure 12A). The mold is made of silicon (col 4 lines 56-67). It is noted that the passages experience a pressure drop or reversal due to evacuation of the passages for rapid filling (col 3 line 52 – col 4 line 15).

2. Claims 1-4, 7, 9, 12-15 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Ference et al. (USPN 5244143).

Ference teaches a method of making solder balls or pads on an electric component the method comprising the injection of molten solder into a guide open at one end wherein the guide is formed by two separable parts, a mold (32) and an injection matrix (34) comprising passages (60, 66, 68) with a narrowing of the guide (upper portion of section 68) at the level of separation of the parts. The parts are separable in the direction of injection. The matrix is separated from the mold while the alloy is still liquid (figures 9-11). The mold may be separated from the solder while the solder is liquid (liquid transfer, col 7 line 48 – col 8 line 16). In another embodiment the mold may be cooled and solidify solder (col 7 lines 1-22). In another embodiment, the mold may be cooled to solidify solder in the mold (col 8 lines 4-28). The liquid solder takes the shape of a ball when cooled (figure 26 and col 8 lines 17-28). A component (50) is positioned in the mold and held by pressure. Liquid solder is injected under pressure (col 5 line 44 – col 6 line 9) which rapidly fills the passages. Liquid is

withdrawn from the matrix into the mold which is cooler (col 6 line 40 – col 7 line 8). The component and mold may be separated while the solder is still liquid such that the solder clings to the component and not to the mold (col 8 lines 1-16 and col 8 line 66 – col 9 line 1-16). The separation of the component from the mold reveals solder pads (mounds 122, col 7 lines 9-47) and may be accomplished by a pressure differential (col 10 lines 21-31). An inert gas (nitrogen) saturates the atmosphere of the alloy and passages (col 5 lines 44-58). The guide comprises a mold (32) and matrix (34) with two parallel faces and coaxially aligned passages which are perpendicular to the faces. The passages have a truncated cone shape with a sudden narrowing at the diameter at the level of separation. The holes in both parts have the same diameter (figure 12A). The mold is made of silicon (col 5 lines 29-43).

3. Claims 13-15, 18, 21, 22, 25 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Cordes et al. (USPN 6105852).

Cordes teaches a guide for making solder balls or pads on an electric component the method comprising the injection of molten solder under nitrogen into a guide open at one end wherein the guide is formed by two separable parts, a mold (21) and an injection matrix (28) comprising passages with a narrowing of the guide (opening 31) at the level of separation of the parts (figures 2, 7 and (col 3 lines 3-25). The parts are separable (by etching) in the direction of injection (col 3 lines 30-34 and col 5 lines 13-28). The parts comprise two parallel faces and coaxially aligned passages which are perpendicular to the faces (figure 2). The first passage in the mold has a larger

diameter than the diameter of the second passage in the matrix and the first passage is semi-spherical. The second passage is cylindrical (figure 7). The mold is made of silicon (col 3 lines 35-38).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 4-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber (USPN 5673846) in view of Ference et al. (USPN 5244143).

Gruber teaches a method of making solder balls or pads on an electric component the method comprising the injection of molten solder into a guide open at one end wherein the guide is formed by two separable parts, a mold (16) and an injection matrix (12) comprising passages with a narrowing of the guide (upper portion of section 18) at the level of separation of the parts. The parts are separable in the direction of injection. The matrix is separated from the mold while the alloy is still liquid (figure 1 and col 2 line 60 – col 3 line 41). The mold may be separated from the solder while the solder is liquid (liquid transfer, col 3 lines 24-41 and col 6 lines 6-29). In another embodiment, the mold may be cooled to solidify solder in the mold (col 8 lines 4-28). The liquid solder takes the shape of a ball when cooled (figures 9A-9C). The guide comprises a mold (16) and matrix (12) with two parallel faces and coaxially

aligned passages which are perpendicular to the faces. The passages have a truncated cone shape with a sudden narrowing at the diameter at the level of separation. The holes in both parts have the same diameter (figure 12A). The mold is made of silicon (col 4 lines 56-67). It is noted that the passages experience a pressure drop or reversal due to evacuation of the passages for rapid filling (col 3 line 52 – col 4 line 15). However, there is no disclosure of the component positioned in the mold.

Ference teaches a method of making solder balls or pads on an electric component the method comprising the injection of molten solder into a guide comprising a mold and injection matrix wherein the component to be soldered (50) is positioned in the mold (col 7 line 9 - col 8 line 16).

It would have been obvious to one of ordinary skill in the art at the time of the invention to position the component in the mold to maintain the solder closely adjacent the substrate (Gruber, col 5 lines 30-43) and thereby facilitate soldering of substrates or chips in a simple and cost-effective manner (Gruber, col 1 lines 10-21).

5. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber (USPN 5673846) in view of Ference et al. (USPN 5244143) as applied to claims 9 above, and further in view of Covell, II et al. (USPN 5718367).

Gruber teaches a method of making solder balls or pads on an electric component the method comprising the injection of molten solder into a guide open at one end wherein the guide is formed by two separable parts, a mold (16) and an injection matrix (12) comprising passages with a narrowing of the guide (upper portion

of section 18) at the level of separation of the parts. The parts are separable in the direction of injection. The matrix is separated from the mold while the alloy is still liquid (figure 1 and col 2 line 60 – col 3 line 41). The mold may be separated from the solder while the solder is liquid (liquid transfer, col 3 lines 24-41 and col 6 lines 6-29). In another embodiment, the mold may be cooled to solidify solder in the mold (col 8 lines 4-28). The liquid solder takes the shape of a ball when cooled (figures 9A-9C). The guide comprises a mold (16) and matrix (12) with two parallel faces and coaxially aligned passages which are perpendicular to the faces. The passages have a truncated cone shape with a sudden narrowing at the diameter at the level of separation. The holes in both parts have the same diameter (figure 12A). The mold is made of silicon (col 4 lines 56-67). It is noted that the passages experience a pressure drop or reversal due to evacuation of the passages for rapid filling (col 3 line 52 – col 4 line 15). However, there is no disclosure of the component positioned in the mold.

Ference teaches a method of making solder balls or pads on an electric component the method comprising the injection of molten solder into a guide comprising a mold and injection matrix wherein the component to be soldered (50) is positioned in the mold (col 7 line 9 - col 8 line 16).

However, there is no disclosure of a neutral environment for reflow.

Covell teaches injection molding of solder wherein solder is subjected to reflow in an oven in a neutral (inert) atmosphere to create higher surface tension (col 5 lines 1-54).

It would have been obvious to one of ordinary skill in the art at the time of the invention employ nitrogen (a common inert gas) as an alternative to the reducing gas to create a neutral atmosphere for reflow (col 6 lines 6-23) and thereby prevent oxide formation and increase surface tension in a conventional and cost-effective manner.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gruber (USPN 5673846) in view of Covell, II et al. (USPN 5718367).

Gruber teaches a method of making solder balls or pads on an electric component the method comprising the injection of molten solder into a guide open at one end wherein the guide is formed by two separable parts, a mold (16) and an injection matrix (12) comprising passages with a narrowing of the guide (upper portion of section 18) at the level of separation of the parts. The parts are separable in the direction of injection. The matrix is separated from the mold while the alloy is still liquid (figure 1 and col 2 line 60 -- col 3 line 41). The mold may be separated from the solder while the solder is liquid (liquid transfer, col 3 lines 24-41 and col 6 lines 6-29). In another embodiment, the mold may be cooled to solidify solder in the mold (col 8 lines 4-28). The liquid solder takes the shape of a ball when cooled (figures 9A-9C). The guide comprises a mold (16) and matrix (12) with two parallel faces and coaxially aligned passages which are perpendicular to the faces. The passages have a truncated cone shape with a sudden narrowing at the diameter at the level of separation. The holes in both parts have the same diameter (figure 12A). The mold is made of silicon (col 4 lines 56-67). It is noted that the passages experience a pressure drop or reversal

due to evacuation of the passages for rapid filling (col 3 line 52 – col 4 line 15). However, there is no disclosure of the component positioned in the mold.

Covell teaches injection molding of solder wherein solder is subjected to reflow in an oven in a neutral (inert) atmosphere to create higher surface tension (col 5 lines 1-54).

It would have been obvious to one of ordinary skill in the art at the time of the invention employ a nitrogen atmosphere (common inert gas) as an alternative to flux for enhanced removal of solder due to surface tension (col 6 lines 6-23) in a safe and cost-effective manner.

***Allowable Subject Matter***

7. Claims 11, 19, 20, 26 and 27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter: The closest prior art teaches vibration for removal of solder from the mold but not for separation of the guide parts (Hertz, USPN 6138562). Neither does the prior art teach the particular instant mold and matrix configuration combinations. By controlling the relationship between mold and matrix shapes and sizes, ball/pad formation can be precisely controlled.

molded solder, separation while molten), Gruber et al. (USPN 6276596 B1), Yu et al (USPN 5735452, injection molded solder), Beaumont et al. (USPN 6003757, two part mold, injected solder) and Capote et al. (USPN 6297560 B1, molded solder, nitrogen reflow).

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne Edmondson whose telephone number is (703) 306-5699. The examiner can normally be reached on M-F from 7-4 with alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (703) 308-3318. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7118 for regular communications and (703) 305-7115 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.

Lynne Edmondson
Examiner
Art Unit 1725

LRE
November 15, 2002

11/15/02